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Douglas Johnson

Lawrence Igl

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CONTRIBUTIONS OF THE CONSERVATION RESERVE PROGRAM TO POPULATIONS OF BREEDING BIRDS IN NORTH DAKOTA

DOUGLAS H. JOHNSON AND LAWRENCE D. IGL

ABSTRACT.—Previous studies have shown that habitat provided by the Conservation Reserve Program (CRP), a feature of the 1985 farm bill, is used by many birds. The present study quantitatively assesses the importance of the CRP by estimating changes in breeding-bird populations of North Dakota projected if CRP land would revert to cultivation. Of 18 species that were common in CRP or crop fields or both, 12 were more abundant in CRP habitats. Six of these species had suffered significant population declines during 1967–1990, according to the North American Breeding Bird Survey. In contrast, none of the six species that were more common in cropland than in CRP fields had declined significantly. Termination of the Conservation Reserve Program and a return of enrolled land to cultivation is projected to cause population declines in North Dakota exceeding 17% for Sedge Wren (*Cistothorus platensis*), Grasshopper Sparrow (*Ammodramus savannarum*), Savannah Sparrow (*Passerculus sandwichensis*), Dickcissel (*Spiza americana*), and Lark Bunting (*Calamospiza melanocorys*). *Received 27 October 1994, accepted 11 May 1995.*

The Conservation Reserve Program (CRP), established by the 1985 Food Security Act and administered by the U.S. Department of Agriculture, resulted in the reversion of millions of hectares of marginal cropland to perennial cover (Young and Osborn 1990). The primary objectives of the CRP were to bring crop supplies more in line with demands and to conserve soil and water resources. Certain highly erodible or eroding lands were removed from agricultural production, through 10-year contracts and annual payments, by establishing perennial vegetation. The intent was to reduce soil erosion, reduce sedimentation of streams, and thus improve water quality. Contracts begin to expire in the next few years, and most landowners indicated an intention to return their lands to cultivation (Mortensen et al. 1989, Kurzejeski et al. 1992).

A secondary objective of the CRP was to enhance habitat for fish and wildlife populations. Grassland habitats established by the CRP benefit a variety of wildlife species (King 1991, Luttschwager and Higgins 1992, Hall and Willig 1994), especially breeding birds (Johnson and Schwartz 1993a, b; Kantrud 1993). Populations of many grassland birds have declined in recent decades, especially in areas of intensive agriculture, such as the Midwest (Warner 1994) and the northern Great Plains (Johnson and Schwartz 1993b). Johnson and Schwartz (1993b) found that the two most common breeding-bird species observed in CRP fields in the north-

[1] National Biological Service, Northern Prairie Science Center Jamestown, North Dakota 58401.

ern Great Plains were Lark Bunting (scientific names are in Table 1) and Grasshopper Sparrow, species that showed declines in midcontinental Breeding Bird Surveys by about 60% during the previous quarter-century. Other declining grassland species such as Dickcissel, Clay-colored Sparrow, Baird's Sparrow, and Bobolink were also common in many CRP fields (Johnson and Schwartz 1993b).

The objective of this paper is to estimate the relative importance of the CRP to breeding populations of grassland birds in North Dakota. We determined the changes in bird populations expected if the land enrolled in CRP were returned to crop production. We used available data collected in 1992 and 1993 from two independent studies in North Dakota (1) surveys of statewide breeding-bird populations and (2) surveys of breeding birds in CRP fields.

STUDY AREAS AND METHODS

Statewide study.—The statewide study was a repeat of a survey originally conducted in 1967 of 130 legal quarter-sections (64.7 ha each), constituting a stratified random sample throughout the state of North Dakota (Stewart and Kantrud 1972). We did not receive permission to survey birds in two of the original quarter-sections, one in 1992 and another in 1993. The total area surveyed was 8335 ha in 1992 and 8332 ha in 1993.

We surveyed breeding birds using methods of Stewart and Kantrud (1972), which allow a fairly rapid assessment of breeding-bird communities in a field or quarter-section. Surveys were conducted by two observers on foot. (Sometimes only a single observer was available; he then covered the two halves in succession.) Each observer surveyed breeding birds on a rectangular half (805 × 402 m; 32.4 ha) of a quarter-section by following a standardized survey route. This route was 100 m inside of and parallel to the sides of the rectangle. We deviated up to 100 m from the route if necessary to adequately survey all habitats. We searched each quarter-section once or twice each year between late April and mid-July.

Surveys began about dawn and ended by midafternoon. Surveys extended beyond the time of most active bird vocalization, but Stewart and Kantrud (1972) concluded that activities of open-country birds were not appreciably affected by time of day other than early morning and late evening. We tallied all indicated breeding pairs, based on singing or calling males, females (for Brown-headed Cowbirds), observed pairs, or presence of an active nest. For individuals observed on the boundary of a plot, we credited the plot with 0.5 pair. We assigned breeding pairs to one of nine major habitat types, including cropland and CRP. We took care to avoid duplication in the counts and surveys under adverse weather conditions (precipitation or strong winds).

We estimated statewide breeding-bird populations, all habitats combined, by multiplying average densities by biogeographical stratum by the area each stratum made up, and summing across strata (Stewart and Kantrud 1972).

CRP study.—The CRP study is a continuing investigation that examines breeding-bird communities in CRP fields in nine counties in Minnesota, Montana, North Dakota, and South Dakota (Johnson and Schwartz 1993a, b). We restrict attention here to three North Dakota counties; Eddy, Kidder, and Hettinger, one in each of the major landforms of North Dakota that contain appreciable areas of CRP habitat (Johnson and Schwartz 1993a, b). We surveyed 132 fields totaling 2734 ha in 1992 and 145 fields totaling 3001 ha in 1993. In addition, several quarter-sections in the statewide study included CRP fields, which we used

TABLE 1

DENSITIES OF BREEDING BIRDS (NUMBER OF PAIRS PER 100 HA) IN NORTH DAKOTA IN CRP FIELDS AND CROP FIELDS, 1992 AND 1993, AND TRENDS IN ABUNDANCE ESTIMATED FROM MIDCONTINENTAL BREEDING BIRD SURVEYS (1967–1990)

Species	1992		1993		BBS trend[a]
	CRP	Crop	CRP	Crop	
Lark Bunting (*Calamospiza melanocorys*)	24.2	2.0	8.6	1.3	−4.22*
Grasshopper Sparrow (*Ammodramus savannarum*)	20.3	1.3	11.7	0.6	−4.58*
Red-winged Blackbird (*Agelaius phoeniceus*)	19.4	1.9	9.7	0.9	−0.04
Savannah Sparrow (*Passerculus sandwichensis*)	6.5	0.1	8.1	1.5	0.63
Western Meadowlark (*Sturnella neglecta*)	6.1	1.3	6.4	1.2	−0.32
Brown-headed Cowbird (*Molothrus ater*)	6.3	1.1	4.6	1.5	−0.26
Bobolink (*Dolichonyx oryzivorus*)	7.4	2.8	3.9	2.1	−2.74*
Clay-colored Sparrow (*Spizella pallida*)	4.5	0.0	4.0	0.0	−2.08*
Common Yellowthroat (*Geothlypis trichas*)	2.1	0.0	2.1	0.0	−0.32
Horned Lark (*Eremophila alpestris*)	2.2	20.1	1.0	29.1	0.15
Mourning Dove (*Zenaida macroura*)	1.8	1.7	0.9	1.6	−0.07
Sedge Wren (*Cistothorus platensis*)	1.0	0.0	1.5	0.0	−0.97
Vesper Sparrow (*Pooecetes gramineus*)	1.7	1.8	0.7	2.9	0.24
Baird's Sparrow (*Ammodramus bairdii*)	0.2	0.3	1.4	0.0	−2.58*
Dickcissel (*Spiza americana*)	1.5	0.2	0.1	0.0	−1.44*
Upland Sandpiper (*Bartramia longicauda*)	0.4	1.0	0.2	0.7	4.14*
Chestnut-collared Longspur (*Calcarius ornatus*)	0.3	1.4	0.2	2.1	−0.47
Killdeer (*Charadrius vociferus*)	0.1	1.1	0.0	1.2	0.25

[a] Asterisk indicates a significant ($P < 0.05$) trend.

to augment our samples of that habitat type. By doing so we added 11 CRP fields totaling 548 ha in both years.

In the northern Great Plains, most CRP land is planted to a mixture of grasses and legumes. Johnson and Schwartz (1993b) reported that most common species in North Dakota CRP fields included alfalfa (*Medicago sativa*), crested and other wheatgrasses (*Agropyron cristatum* and *A.* spp.), and smooth brome (*Bromus inermis*). Most CRP fields have remained relatively idle during the contract period, although some fields were released for emergency haying and grazing due to drought in several years and flooding in 1993. These disturbances took place after birds were surveyed each year.

We surveyed birds in CRP fields using the same methods as in the statewide study, except that a single observer surveyed small fields. We surveyed each field once each year between late May and early July. We computed densities of indicated breeding pairs for each species in CRP habitat. We projected these densities to the state by multiplying them by the total area of CRP in the state (1,287,133 ha). Implicit in this computation is the assumption that the fields we surveyed were representative of CRP fields throughout the state.

We also compared densities of breeding birds in CRP and in cropland. Cropland estimates were based on fields encountered in our statewide survey involving 4115 ha in 1992 and 4146 ha in 1993. To predict the consequences of the termination of the CRP and conversion of CRP fields to cropland, we substituted cropland densities for CRP densities into the values that made up statewide totals. This procedure assumes that all CRP fields would return to cultivation; about 15% of CRP contract holders in North Dakota surveyed indicated that they would retain permanent cover on their fields (Mortensen et al. 1989). Actual retention would depend on commodity prices and other dynamics of the agricultural marketplace.

Trends.—We obtained trends in abundance of grassland bird species from the Breeding Bird Survey (BBS) (Robbins et al. 1986) during 1967–1990 for the Central Region of North America between the Rocky Mountains and the Mississippi River (J. R. Sauer and B. G. Peterjohn, pers. commun.). Trends are based on statistical methods described by Geissler and Sauer (1990).

RESULTS

Of the 18 species that occurred commonly in CRP or cropland fields, 12 were more common in CRP fields than in cropland (Table 1). One, the Sedge Wren, occurred only in CRP. Six of the species that favored CRP habitat had suffered significant ($P < 0.1$) population declines; the Grasshopper Sparrow and Lark Bunting, for example, each declined by about two-thirds during 1967–1990. The Mourning Dove, an edge species, was nearly equally common in the two habitat types. Species more common in cropland than in CRP were Horned Lark, Vesper Sparrow, Upland Sandpiper, Chestnut-collared Longspur, and Killdeer, species that tend to avoid the taller and denser vegetation in CRP fields. None of those five species nor the Mourning Dove had exhibited population declines during 1967–90.

Estimated numbers of breeding pairs in CRP fields, and in all habitats, for North Dakota in 1992 and 1993 demonstrate the extensive use of CRP by many species (Table 2). CRP composed only about 7% of the land in North Dakota but supported more than 20% of the statewide population

TABLE 2
ESTIMATED NUMBERS OF BREEDING PAIRS (1000'S) STATEWIDE, IN CONSERVATION RESERVE PROGRAM FIELDS, AND PERCENTAGE, IN NORTH DAKOTA, 1992 AND 1993

	1992			1993		
Species	State	CRP	Percent	State	CRP	Percent
Lark Bunting	1540.6	311.0	20.2	686.1	110.8	16.1
Grasshopper Sparrow	889.7	261.2	29.4	1000.8	150.3	15.0
Red-winged Blackbird	1306.1	250.2	19.2	1535.6	124.4	8.1
Savannah Sparrow	294.6	83.5	28.4	595.9	104.1	17.5
Western Meadowlark	1079.5	78.2	7.2	1440.8	82.0	5.7
Brown-headed Cowbird	555.4	81.4	14.7	772.0	59.1	7.7
Bobolink	405.0	95.5	23.6	370.9	50.0	13.5
Clay-colored Sparrow	563.6	57.5	10.2	622.2	51.1	8.2
Common Yellowthroat	196.3	27.5	14.0	375.2	26.5	7.1
Horned Lark	2412.0	27.8	1.2	3671.6	12.3	0.3
Mourning Dove	741.6	23.7	3.2	732.7	11.4	1.6
Sedge Wren	43.1	12.5	29.1	19.2	79.7	24.1
Vesper Sparrow	479.1	21.2	4.4	843.8	8.7	1.0
Baird's Sparrow	170.7	3.1	1.8	278.7	17.6	6.3
Dickcissel	73.5	19.4	26.4	30.5	0.7	2.4
Upland Sandpiper	236.2	5.5	2.3	198.2	2.9	1.5
Chestnut-collared Longspur	1350.6	4.1	0.3	1707.4	2.2	0.1
Killdeer	247.9	1.2	0.5	311.8	0.4	0.1

of many species in one or both years. That percentage, averaged for the two years, was 26.6 for Sedge Wren, 22.9 for Savannah Sparrow, and 22.2 for Grasshopper Sparrow. At the other extreme, CRP supported only about 2.7% of Vesper Sparrows and 0.7% of Horned Larks in the state.

If we assume the return of CRP habitat to cropland and substitute densities of breeding birds in cropland for densities in CRP, we obtain a measure of the importance of CRP to each species (Table 3). Conversion of CRP to cropland would have reduced numbers of Sedge Wrens by 25.8%, Grasshopper Sparrows by 20.5%, and Savannah Sparrows by 18.8%. Conversely, numbers of Horned Larks and Vesper Sparrows would have risen by 9.7% and 2.3%, respectively.

DISCUSSION

Previous studies have shown that many bird species benefit from grassland habitats established by the CRP (Burger et al. 1990; King 1991; Luttschwager and Higgins 1992; Johnson and Schwartz 1993a, b; Kantrud 1993; Patterson 1994; Reynolds et al. 1994). We found that CRP fields are especially important for grassland birds during the breeding season,

TABLE 3

ESTIMATED NUMBER OF BREEDING PAIRS (1000'S) OF BIRDS IN CRP FIELDS IN NORTH DAKOTA, ESTIMATED NUMBER IF CRP WERE CROPLAND, PREDICTED CHANGE IN BREEDING PAIRS, STATEWIDE NUMBER OF BREEDING PAIRS, AND PREDICTED CHANGE AS PERCENTAGE OF STATEWIDE POPULATION, MEAN VALUES FOR 1992–1993

Species	Population in		Change	Statewide population	Percent change
	CRP	Crop			
Lark Bunting	210.9	21.2	−189.7	1113.4	−17.0
Grasshopper Sparrow	205.7	12.4	−193.4	945.2	−20.5
Red-winged Blackbird	187.3	17.8	−169.5	1420.9	−11.9
Savannah Sparrow	93.8	10.2	−83.6	445.2	−18.8
Western Meadowlark	80.1	15.8	−64.4	1260.2	−5.1
Brown-headed Cowbird	70.2	17.1	−53.1	663.7	−8.0
Bobolink	72.8	31.2	−41.6	387.9	10.7
Clay-colored Sparrow	54.3	0.3	−54.0	592.9	−9.1
Common Yellowthroat	27.0	0.3	−26.7	285.8	−9.3
Horned Lark	20.1	316.2	296.1	3041.8	9.7
Mourning Dove	17.6	21.6	4.0	737.1	0.5
Sedge Wren	15.8	0.0	−15.8	61.4	−25.8
Vesper Sparrow	15.0	30.2	15.2	661.4	2.3
Baird's Sparrow	10.4	2.3	−8.0	224.7	−3.6
Dickcissel	10.1	1.2	−8.9	52.0	−17.1
Upland Sandpiper	4.2	10.1	5.9	217.2	2.7
Chestnut-collared Longspur	3.1	22.3	19.1	1529.0	1.3
Killdeer	0.8	14.5	13.7	279.8	4.9

including Sedge Wrens, Grasshopper Sparrows, Savannah Sparrows, Dickcissels, Lark Buntings, Red-winged Blackbirds, Common Yellowthroats, Clay-colored Sparrows, and Bobolinks. Six of these species had suffered appreciable declines between 1967, when Breeding Bird Surveys began in the region, and 1990.

Declines in grassland bird populations have been attributed to a number of causes, including the loss of suitable nesting habitat on the breeding grounds. The vast grasslands that once dominated the landscape in the northern Great Plains are largely gone or degraded (Samson and Knopf 1994). Recent analysis of BBS data indicates that some species that were declining in North Dakota before the CRP began (i.e., 1967–1986), such as the Grasshopper Sparrow and the Lark Bunting, have shown population increases coincident with the establishment of perennial grasslands after the CRP began (i.e., 1987–1992) (Reynolds et al. 1994). These results, in combination with our findings, suggest that the CRP provides not only important breeding habitat for some grassland birds but also a possible vehicle for restoring abundant populations of these species.

Most of the species more common in cropland than in CRP fields select the sparser cover that cropland affords (e.g., Graber and Graber [1963] and Stewart [1975] for Killdeer; Owens and Myres [1973] and Skinner [1975] for Horned Lark; Owens and Myres [1973] for Chestnut-collared Longspur; Wiens [1969], Owens and Myres [1973], and Rodenhouse and Best [1983] for Vesper Sparrow). Conversely, the Upland Sandpiper frequently forages in sparse cover (Graber and Graber 1963) but prefers to nest in somewhat more robust vegetation (Kantrud and Higgins 1992, Bowen and Kruse 1993). Higher densities of Upland Sandpipers found in cropland may reflect use primarily for foraging, and CRP fields may offer nesting habitat that is otherwise limited in highly cultivated or heavily grazed areas of the northern Great Plains.

Although the comparisons we made apply to North Dakota, the implications extend to other areas in the northern Great Plains. Currently, there are nearly 4 million ha enrolled in CRP in the northern Great Plains (Montana, Minnesota, North Dakota, and South Dakota), which accounts for nearly one-quarter of the total land in the CRP nationwide (Johnson et al. 1994).

Recent evidence suggests that CRP also benefits grassland bird populations in other areas of intensive agriculture such as the Midwest. In Nebraska, King (1991) found 16 species of birds in CRP fields and 13 species in native prairie during the breeding season, compared with only two species, Horned Lark and Killdeer, in cropland. Likewise, in Iowa, Patterson (1994) found 16 species of birds nesting in CRP fields compared with only two species, Horned Lark and Vesper Sparrow, in similar areas of cropland. Our data indicate that the addition of CRP habitat in the North Dakota landscape reduced numbers of a few species, such as Horned Larks and Vesper Sparrows, species whose populations had not declined in the last quarter-century.

Some breeding birds were undoubtedly missed in our single survey (e.g., Järvinen and Lokki 1978). The same techniques were used in both surveys, however, so any bias should be consistent. Because estimates of population size are minimal, projections of population change anticipated from termination of CRP are conservative. Projections also assume habitat-specific densities of species and that densities in one habitat will not change dramatically in response to changes in the availability of another. This simplifying assumption is necessary and probably adequate as long-term averages. The year-to-year variability evident in the densities of birds (Table 2) also points to the need to consider averages over long periods of time.

Our projections are based on the assumption that all CRP fields would be returned to cultivation. Some small fraction would likely be retained

in perennial vegetation and used for grazing or forage production (Mortensen et al. 1989). Such habitat would support different bird populations from cropland, but probably lower numbers than CRP habitat maintains.

Although we did not examine reproductive success, it seems reasonable that birds are more successful in robust and undisturbed cover than they would be in crop fields, most of which are cultivated, sprayed, or otherwise disturbed frequently during the breeding season (e.g., Best 1986). For several waterfowl species, Kantrud (1993) and Reynolds et al. (1994) found that nest success in CRP fields was as high or higher than in habitats specifically purchased and managed for waterfowl production.

The Conservation Reserve Program is an agricultural commodities program and is inherently expensive. As such, it does not compete with programs to conserve habitat for wildlife. The primary benefits of CRP include major reductions in soil erosion in the Great Plains; from 1987 to 1992 North Dakota croplands experienced a 68% reduction in erosion from wind and a 22% reduction in erosion from water (USDA 1994). CRP does, however, offer far greater benefits to breeding birds and other wildlife populations than do other agricultural programs such as annual set-asides and summer fallow.

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ERRATUM

In "Diet of nesting killdeer in North Dakota" by Jeanne M. Fair, Patricia L. Kennedy and Lowell C. McEwen (Wilson Bull. 107:174–178) one incorrect line occurs in the text. The second line in the last paragraph should read "Orthoptera *availability* fell within the Bonferonni 95% confidence interval for the expected proportion, Coleoptera was lower than the confidence interval, and other arthropods were above the interval.